Climate Change and Transportation

Kentucky's 2008

Regional Air Quality Conference

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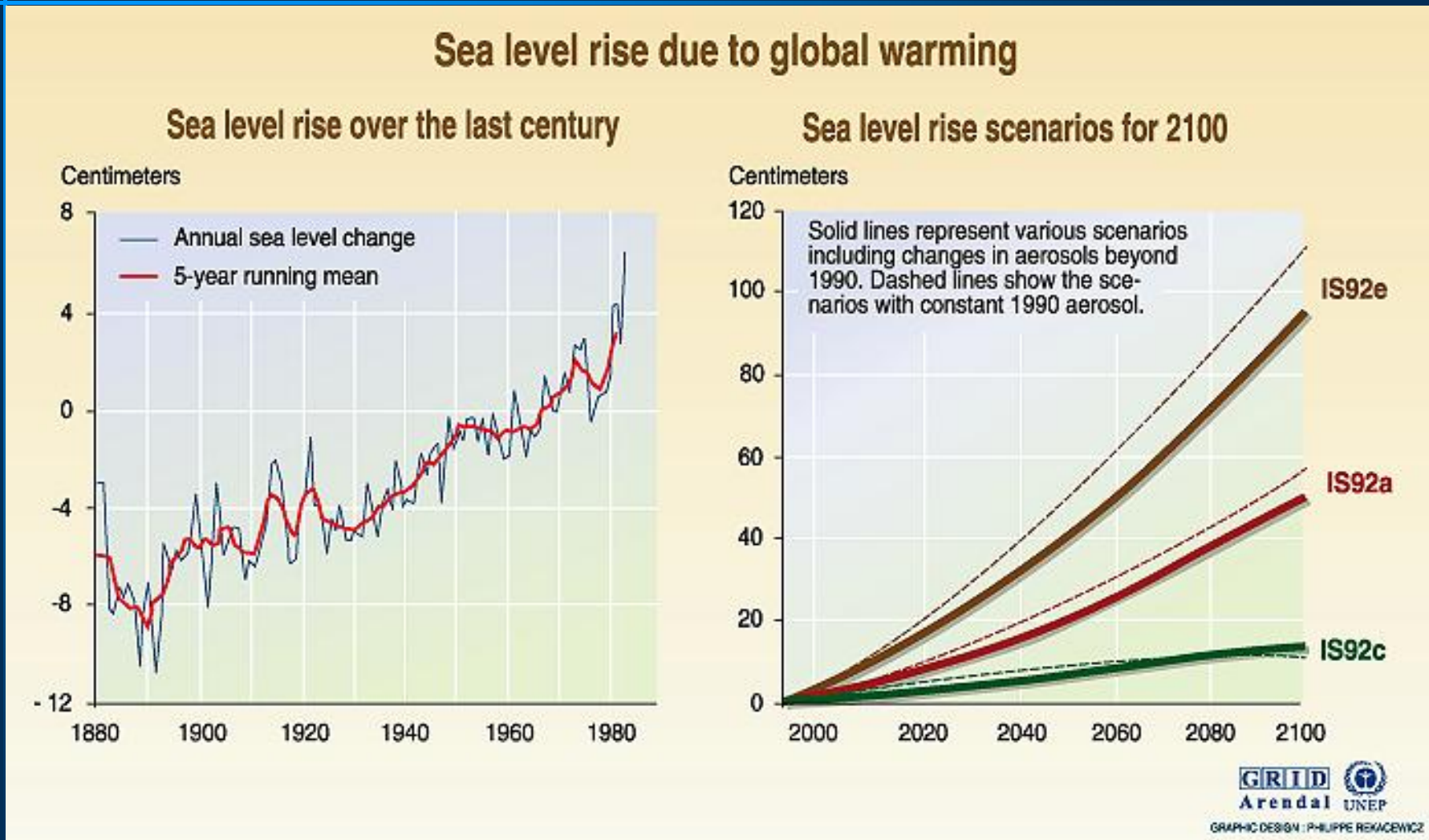
Overview

- ***Why should transportation agencies care?***
- ***How will climate change affect transportation?***
- ***What can be done?***

Why Should We Care?
What We Know About Climate Change

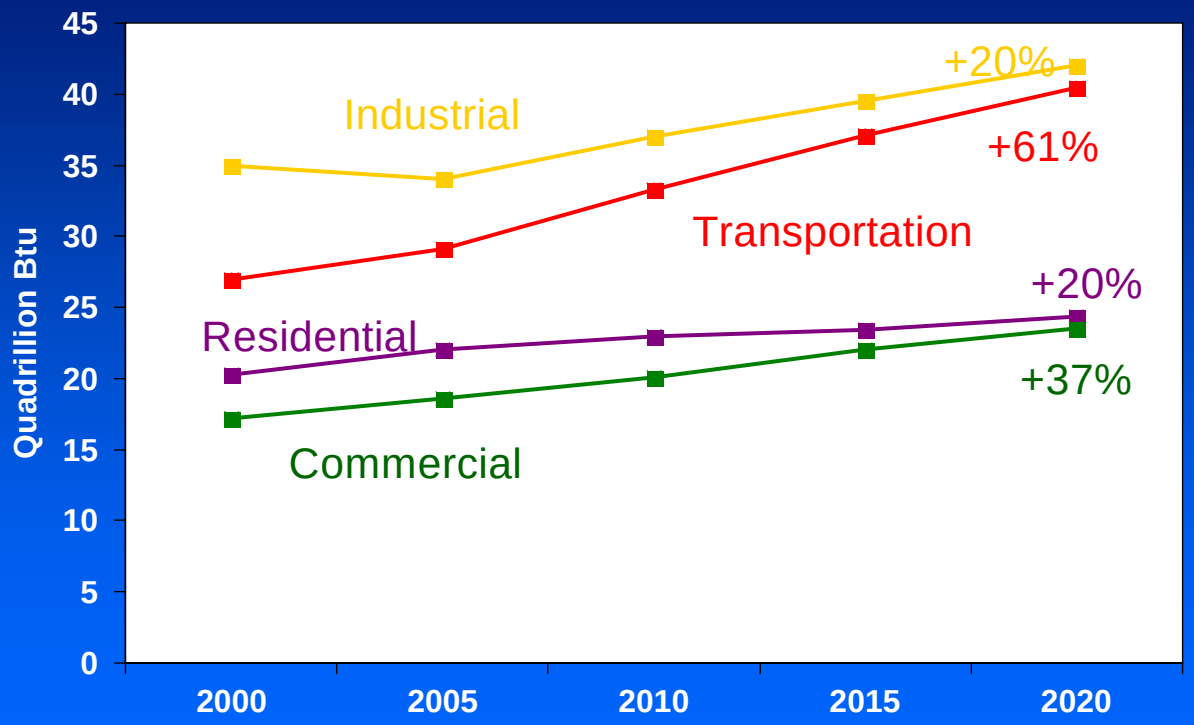
- **Temperature is Rising**
  - **Global temperature rose 0.6 degrees C over past century**
  - **Recent CCSP report no longer finds a discrepancy between satellite and other data**
- **Sea Level is Rising**
  - **10-20 cm over the past 100 years**
  - **Rate expected to increase 2-4 times over next century**
- **James Mahoney, CCSP Director (Senate 2005): “We know that an increase in greenhouse gases from the use of energy from fossil fuels and other human activities is associated with the warming of the Earth’s surface.”**

Why Should We Care?
The Climate is Changing - Sea Level Rise



Source: Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1995; Sea level rise over the last century, adapted from Gornitz and Lebedeff, 1987.

Why Should We Care?
Energy Trends By Sector



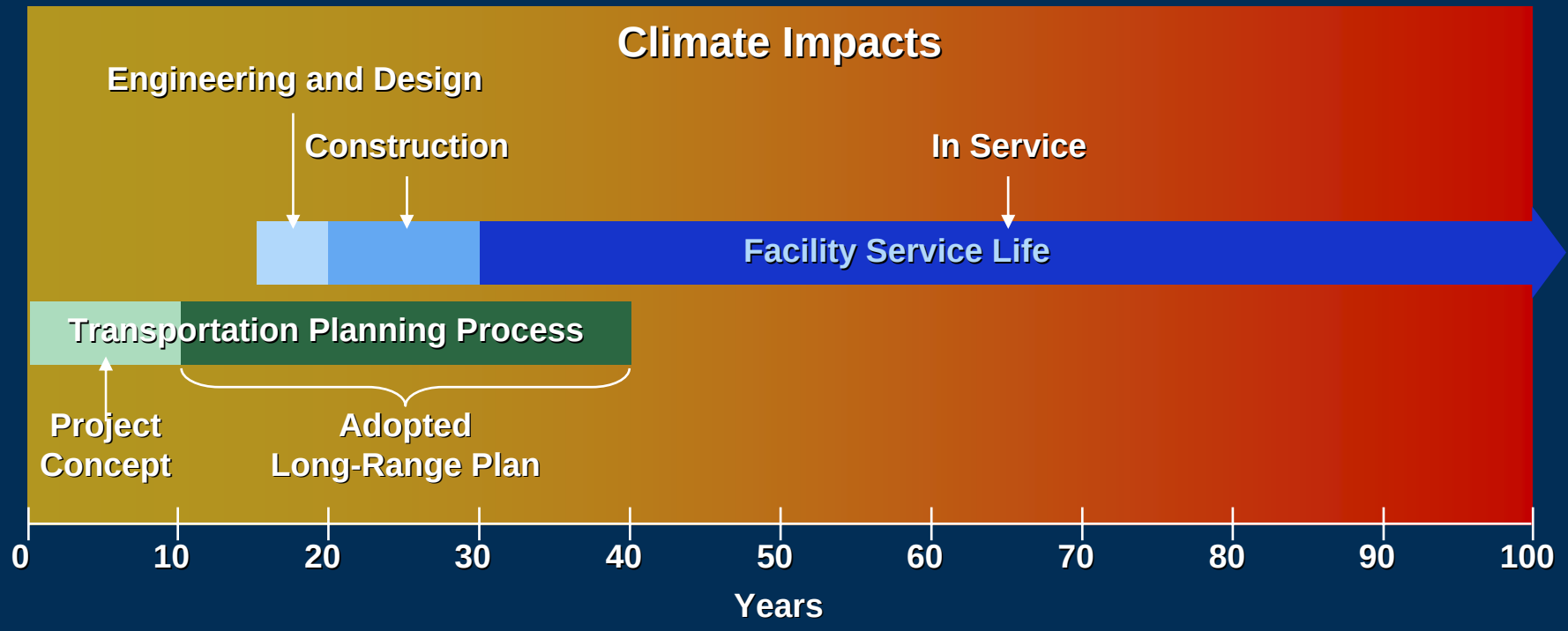
Source: Energy Information Administration, Annual Energy Outlook 2003.

Why Should We Care?

The Potential for Costly Impacts

- **Two New Reports**
- **National Academies of Science (TRB/DELS): Potential Impacts of Climate Change on Transportation, 3/12/08**
- **DOT/USGS: The Gulf Coast Study, 3/13/08**

Transportation Timeframes vs. Climate Impacts



Results - Gulf Coast Study

Vulnerability Due to…Relative Sea-Level Rise

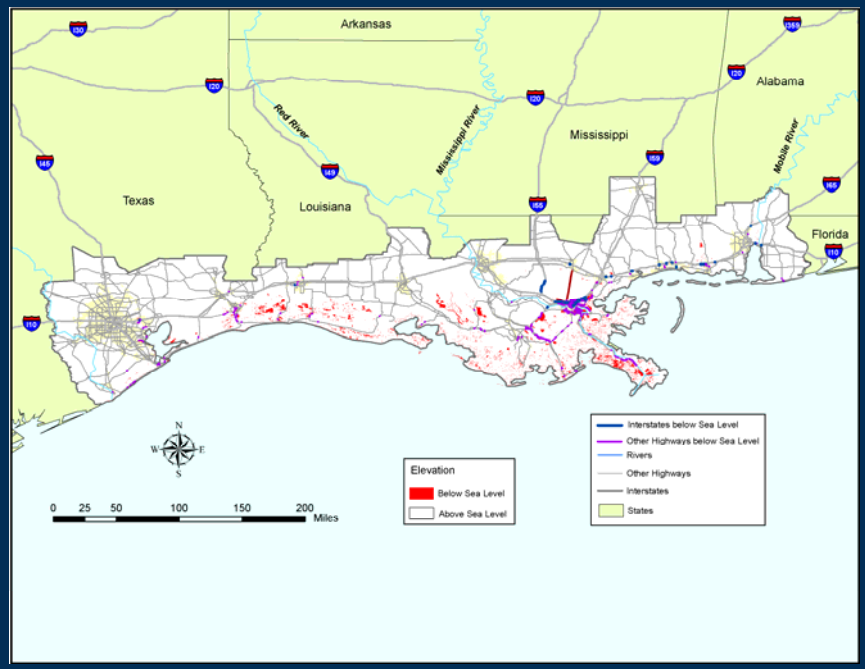
- **Relative sea level rise (due to climate change and subsidence) of 4 feet could permanently flood:**

- ✓ **24% of interstate miles, 28% of arterial miles, New Orleans Transit**
  - ✓ ***More than 2,400 miles of roadway are at risk of permanent flooding***
- ✓ **72% of freight / 73% of non-freight facilities at ports**
- ✓ **9% of the rail miles operated, 20% of the freight facilities, no passenger stations**
- ✓ **3 airports**
- ✓ **Temporary flooding in low-lying areas due to increased heavy downpours will broaden affected areas**

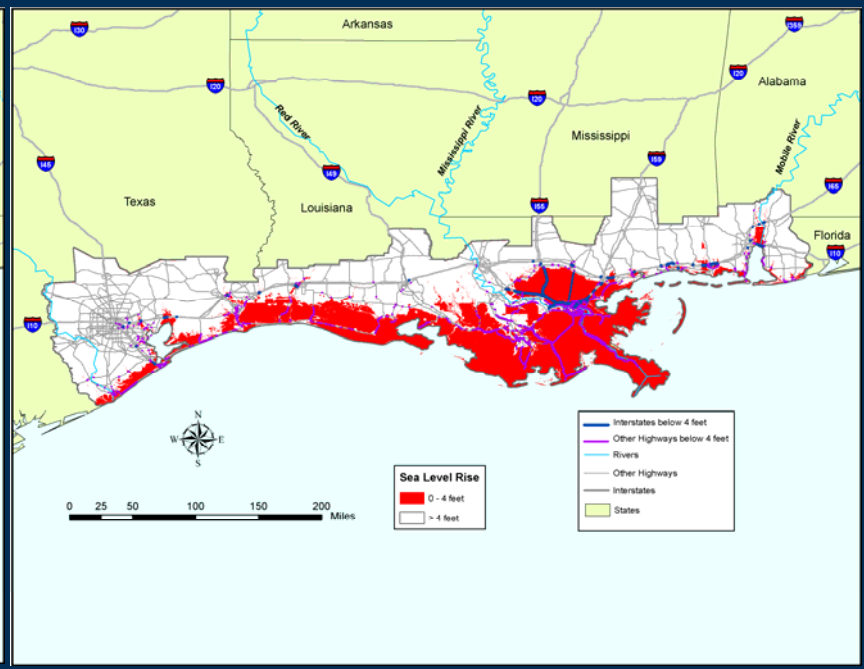
Results – Gulf Coast Study

Highways Vulnerable to Relative Sea Level Rise

Baseline (Present Day)



4 Feet of Sea Level Rise



Source: Cambridge Systematics analysis of U.S. DOT Data.

Results – Gulf Coast Study

Vulnerability Due to…Storm Surge

- Transportation infrastructure that is vulnerable to 18 feet of storm surge includes:

- ✓ 51% of interstate miles, 56% of arterial miles, and most transit authorities

- ✓ 98% of port facilities vulnerable to surge and 100% to wind

- ✓ 33% of rail miles operated, 43% of freight facilities

- ✓ 22 airports in the study area at or below 18 feet MSL

- ✓ Potentially significant damage to offshore facilities

Hurricane Katrina Damage to Highway 90 at Bay St. Louis, MS

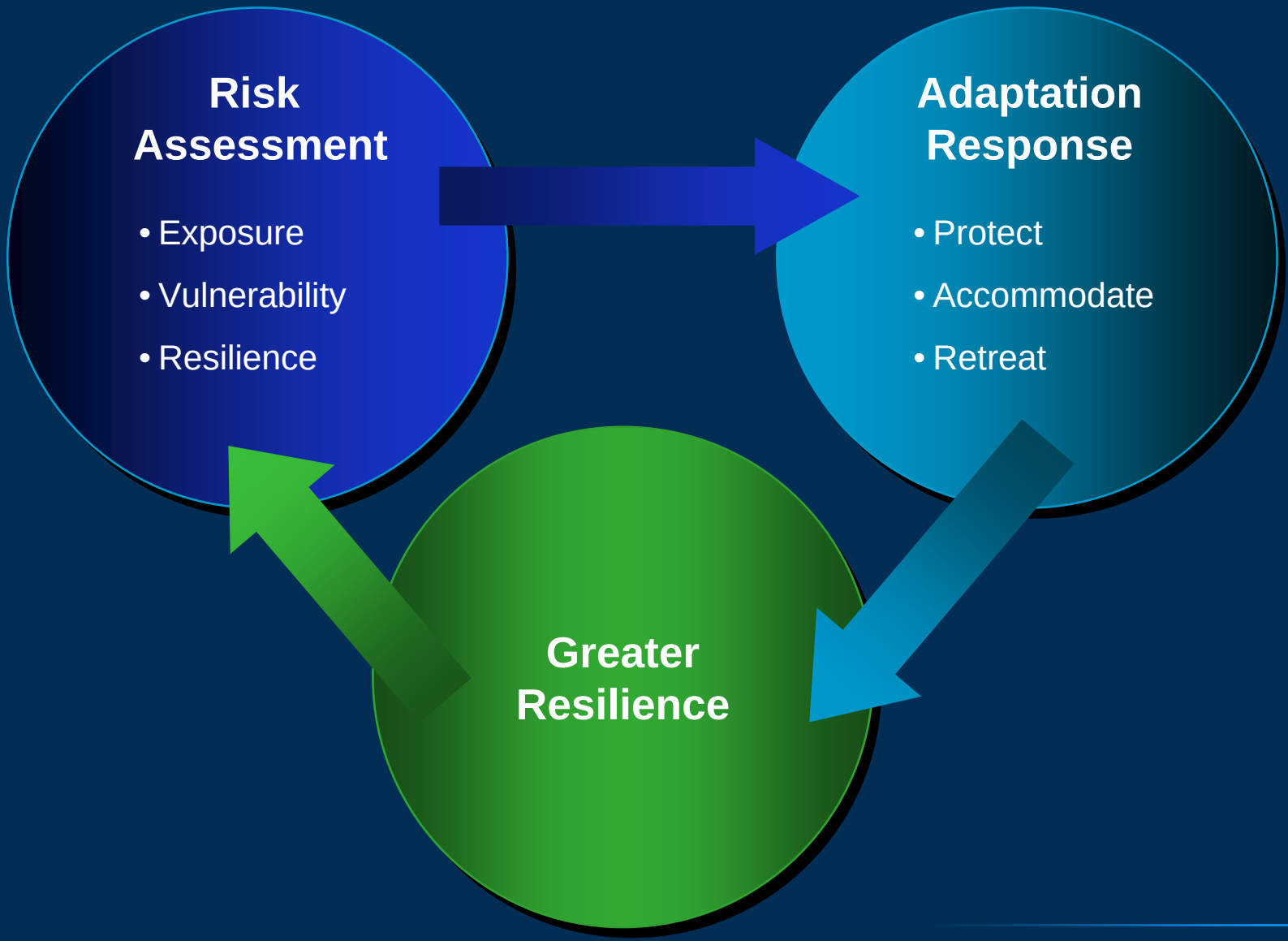
Source: NASA Remote Sensing Tutorial.

Results – Gulf Coast Study

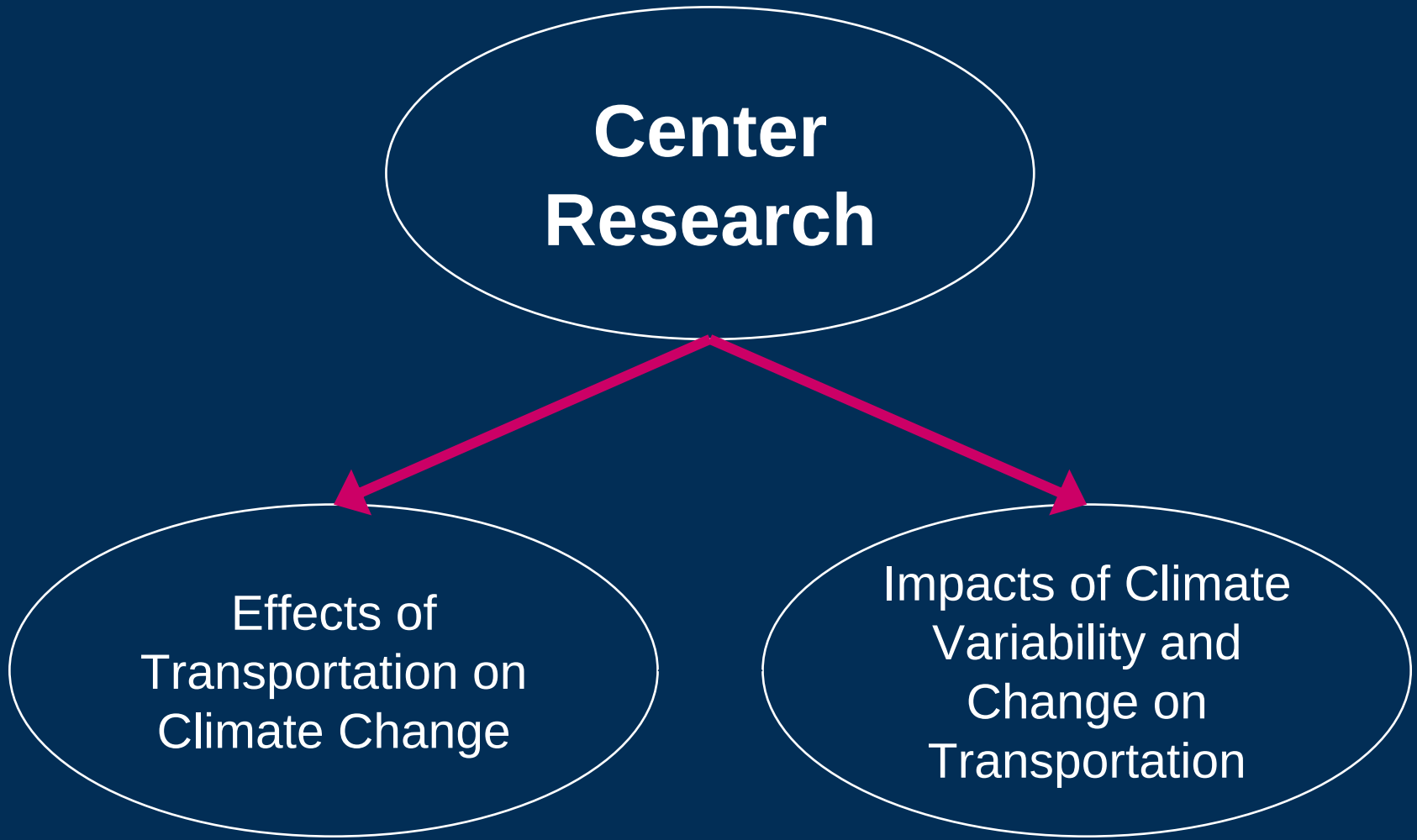
Vulnerability Due to…Temperature increases

- As temperatures increase, operations will be affected:
  - Potential change in maintenance and construction practices
  - Increased use of energy for refrigerated storage
  - Potential rise in rail buckling
  - May result in impacts to aircraft performance and runway utilization

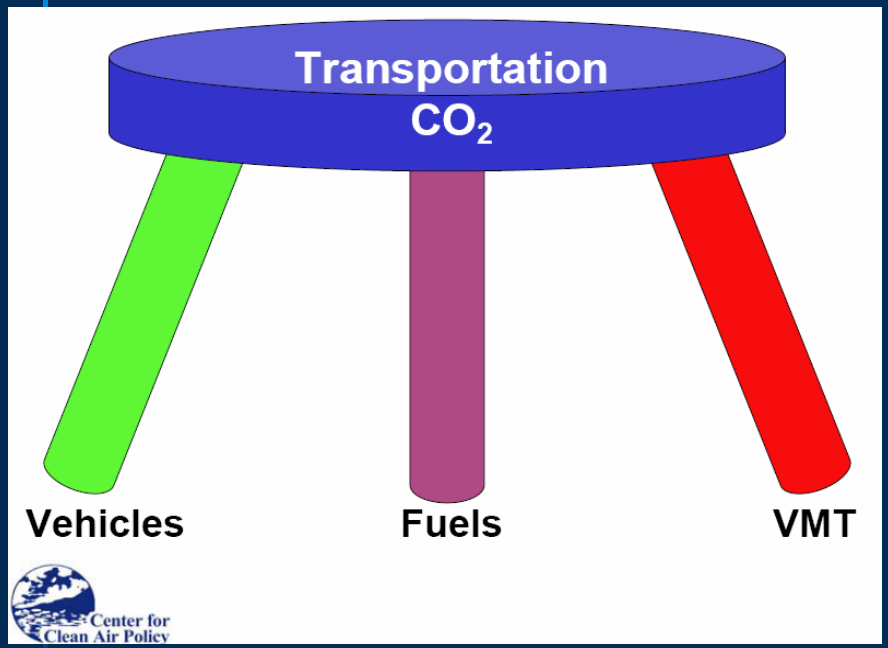
A Risk Assessment Approach to Transportation Decisions



What can be done to reduce greenhouse gases?
DOT Center for Climate Change



What can be done to reduce Greenhouse Gases?
Transportation Strategies—"three-legged stool"



- Raise vehicle energy efficiency
- Reduce carbon content of fuels
- Improve energy efficiency of transportation systems
  - VMT, higher occupancy, transit, land use, etc.

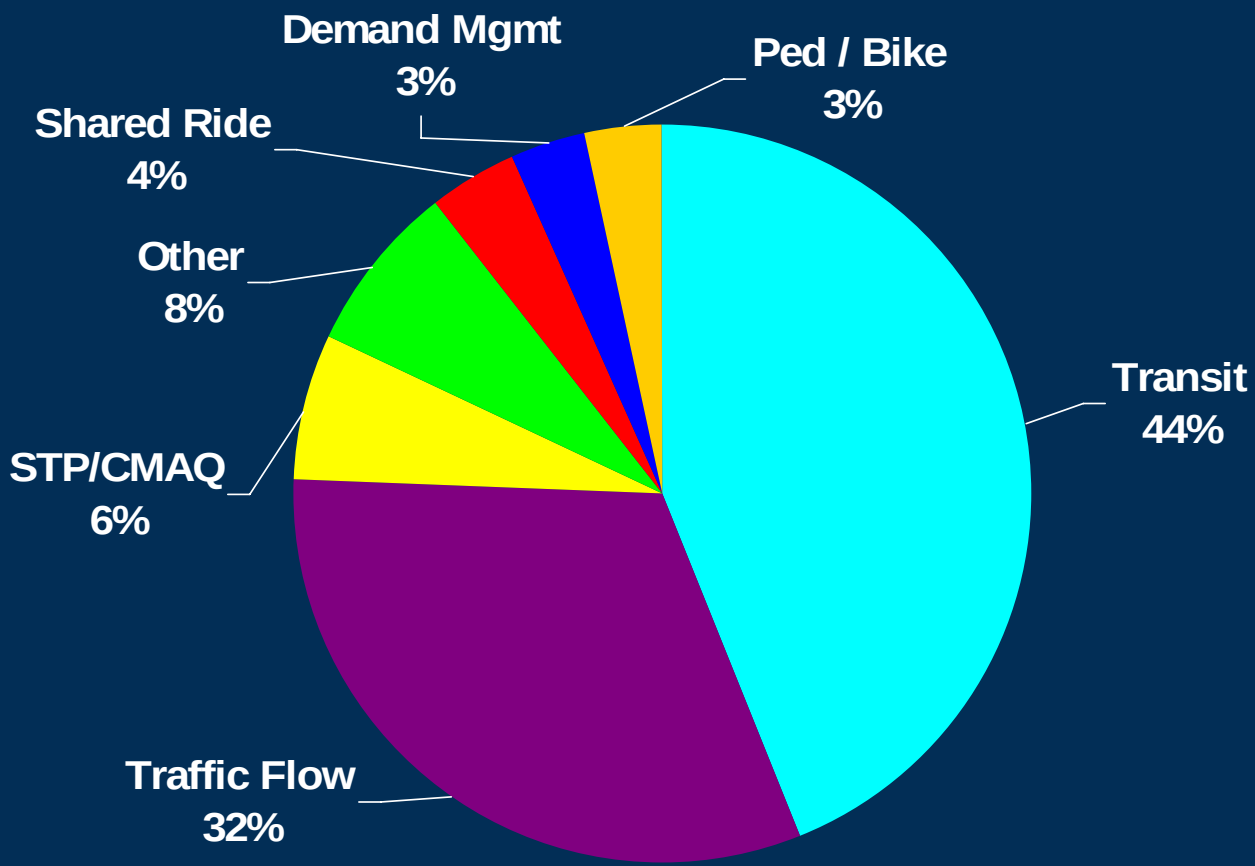
What can be done to reduce greenhouse gases? Policy Considerations

- **Timing of Greenhouse Gas Impacts**
- **Effectiveness Factors**
- **Level of Implementation (National, State or Local)**

What can be done to reduce greenhouse gases? Improve Energy Efficiency

- Higher Occupancy
- Alternative Modes
- Fuel-Efficient Vehicles
- Congestion Pricing
- Parking Management
- Efficient Land Uses
- ITS/Traffic Operations
- Freight Strategies
  - Idle Reduction
  - EPA SmartWay Strategies

What can be done to reduce greenhouse gases?
CMAQ Funding by Project Type, ’92 –’03



What can be done to reduce greenhouse gases?
ARTIMIS, Cincinnati/Northern Kentucky

An on-line picture from one of ARTIMIS' many cameras.

What can be done to reduce greenhouse gases?
A National Strategy to Reduce Congestion on America's Transportation Network

- According to the Texas Transportation Institute, in 2003, congestion caused 3.7B hours of travel delay and 2.3B gallons of wasted fuel, for a total cost of $63B.
- Total costs would be much higher if unreliability, inventory and environmental costs (among others) were included

What can be done to reduce greenhouse gases? Reduce Carbon Content of Fuels

- Energy Independence and Security Act, 2007
- Renewable Fuels
  - Ethanol from Corn
  - Ethanol from Biomass
  - Biodiesel
- Low/No Carbon Fuels
  - Electric
  - Hybrids
  - Hydrogen

What can be done to reduce greenhouse gases? Vehicle Fuel Economy Improvements

- CAFÉ
- Markets
  - Hybrids
- Policy Measures
  - Incentives (e.g. SAFETEA-LU provisions)

What can be done to reduce greenhouse gases? Challenges

- US anthropogenic sources of CO2 are roughly 6 billion tons per year
- Ambient concentrations will likely continue to rise
  - "Wedge Analysis" seeks to limit concentrations to a doubling of carbon dioxide
- Many transportation strategies are long term or locally implemented

What can be done to reduce greenhouse gases? Opportunities

- **Multiple benefits of many transportation strategies**
  - **Air pollution reduction**
  - **Congestion relief/Enhanced mobility**
  - **Greater livability**
  - **Enhanced sustainability**
- **Advances US technologies worldwide**

Other New Developments in Air Quality

- CMAQ
  - New provisions under the Energy Independence and Security Act
- Mobile Source Air Toxics
  - New HEI Report
  - MSAT Settlement Study
- New Ozone Air Quality Standards